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Dark Energy and Fate of the Universe

Xiao-Dong Li, Shuang Wang, Qing-Guo Huang, Xin Zhang, Miao Li

(Submitted on 18 Feb 2012 (v1), last revised 24 Apr 2012 (this version, v2))

We explore the ultimate fate of the Universe by using a divergence-free parametrization for dark energy $w(z)=w_0+w_a({\ln (2+z)\over 1+z}-\ln2)$. Unlike the CPL parametrization, this parametrization has well behaved, bounded behavior for both high redshifts and negative redshifts, and thus can genuinely cover many theoretical dark energy models. After constraining the parameter space of this parametrization by using the current cosmological observations, we find that, at the 95.4% confidence level, our Universe can still exist at least 16.7 Gyr before it ends in a big rip. Moreover, for the phantom energy dominated Universe, we find that a gravitationally bound system will be destroyed at a time $t \simeq P\sqrt{2|1+3w(-1)|}/[6\pi |1+w(-1)|]$, where P is the period of a circular orbit around this system, before the big rip.

Comments:	5 pages, 3 figures; typos corrected, publication version, Sci China-Phys Mech Astron, doi: 10.1007/s11433-012-4748-z
Subjects:	**Cosmology and Extragalactic Astrophysics (astro-ph.CO)**; General Relativity and Quantum Cosmology (gr-qc); High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Theory (hep-th)
DOI:	10.1007/s11433-012-4748-z
Report number:	USTC-ICTS-12-06
Cite as:	**arXiv:1202.4060v2 [astro-ph.CO]**

Submission history

From: Xin Zhang [view email]
[v1] Sat, 18 Feb 2012 05:22:42 GMT (289kb)
[v2] Tue, 24 Apr 2012 09:50:55 GMT (290kb)

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